JENNY SCIENCE

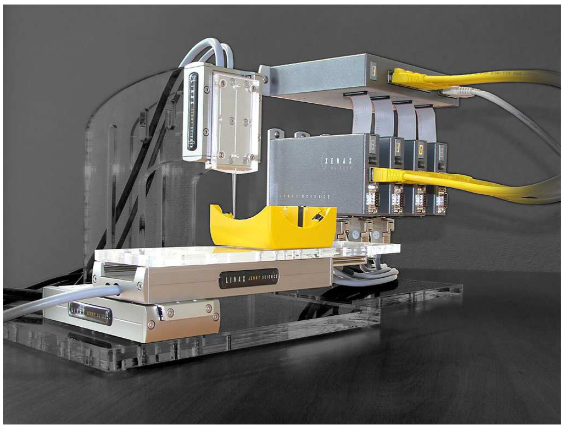
exceptional motion controls

UNAX® Ux4

Instruction Manual

Multi-axis motion coordinator for XENAX® servo controllers

Edition September 2012



Compact multi-axis motion coordinator with TCP/IP web technology

Commissioning and parameterisation of servo axes by web browser.
Axis coordinator free programmable in BASIC syntax for standalone applications.

General

This instruction manual describes the multi-axis motion coordinator UNAX® Ux4 with XENAX® slave servo controller.

The document contains necessary information about commissioning, set up, electrical connections, programming and error handling.

The operating system of the multi-axis motion coordinator in addition to the axis user interface WebMotion® is installed, so the UNAX® system is instantly ready to use.

We will gladly answer your questions you may have or supply additional information.

Alois Jenny
Jenny Science AG

Contents

1 System overview

The UNAX® system stands for clear structured control hierarchic.

The multi-axis motion coordinator is able to coordinate and interpolate up to four servo axes.

Over the internal TCP/IP communication gateway of UNAX®, programming and parameterisation of servo axis operates by web application WebMotion®.

Set IP address in browser, select servo axis and the WebMotion® graphic user interface looks like a peer to peer connection to a certain XENAX® servo controller.

UNAX® multi-axis motion coordinator

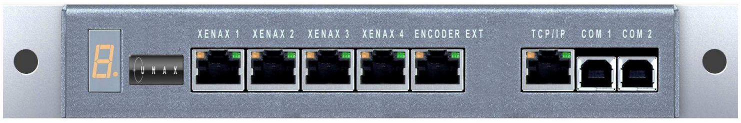
XENAX® slave servo controller

LINAX® linear motor

2 Electrical Connections

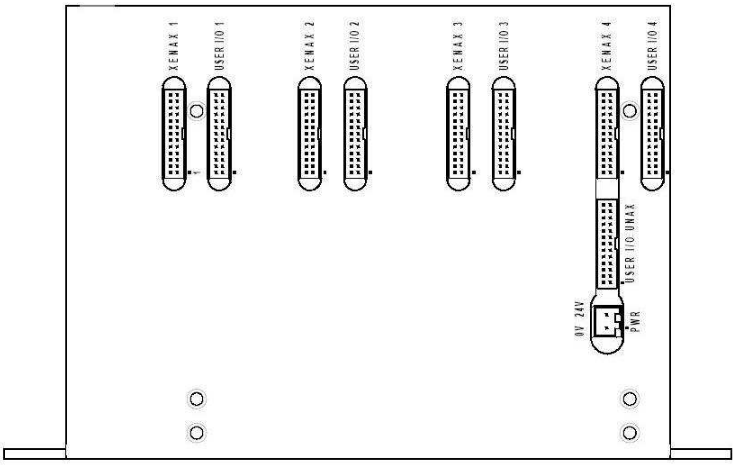
front

DESCRIPTION	PLUG
XENAX 1..XENAX 4	8 Pole Jack RJ45 with status LED
ENCODER EXT	8 Pole Jack RJ45 with status LED
TCP/IP	8 Pole Jack RJ45 with status LED
COM1	USB Type B
COM2	USB Type B



underside

XENAX 1 ..4	26 Pole FCI connector for XENAX® control
USER I/O 1 .. 4	26 Pole FCI connector free PLC of XENAX®
USER_I/O_UNAX	26 Pole FCI connector application free programmable
PWR	2 Pole WAGO power UNAX®

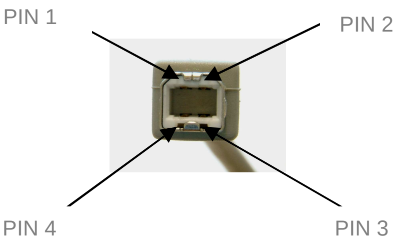


2.1 Pin configuration

COM 1 / COM 2

The two serial interfaces RS232 are wired to USB B connectors.

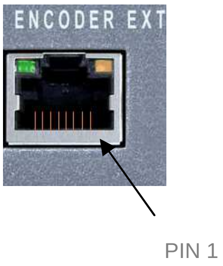
USB B connector	COM connector PC/Laptop
Pin 2	Pin 3
Pin 3	Pin 2
Pin 4	Pin 5



Communication cable is part of shipment

ENCODER EXT

RJ45 Jack	Description
Pin 1	GND
Pin 2	+5V
Pin 3	A
Pin 4	B
Pin 5	-B
Pin 6	-A
Pin 7	Z
Pin 8	-Z



PWR

POWER -	Pin 1	white	0, GND
POWER +	Pin 2	brown	24VDC

XENAX 1 .. 4

PLC connection via ribbon cable to XENAX® slave servo controller.

Ribbon cables are part of shipment

USER I/O 1 .. 4

Unused PLC I/O's from XENAX®
slave servo controller

Note:
Description "Input" and "Output" is from XENAX®'s
point of view.

	Pin 1		NC, reserved for UNAX® handshake
	Pin 2		NC, reserved for UNAX® handshake
	Pin 3		NC, reserved for UNAX® handshake
Active low, NPN open collect. 50V/350mA, freewheel. diode	Pin 4	yellow	Output 4
Active low, NPN open collect. 50V/350mA, freewheel. diode	Pin 5	grey	Output 5
Active low, NPN open collect. 50V/350mA, freewheel. diode	Pin 6	pink	Output 6
Active low, NPN open collect. 50V/350mA, freewheel. diode	Pin 7	blue	Output 7
Active low, NPN open collect. 50V/350mA, freewheel. diode	Pin 8	red	Output 8
Power supply voltage protected with 100mA poly-switch With 24V supply usable for input signal level	Pin 9	black	PWR
2A	Pin 10	violet	GND
2A	Pin 11	grey-pink	GND
250mA	Pin 12	red-blue	5V
24V Pull Down *	Pin 13	white-green	Input 9
24V Pull Down *	Pin 14	brown-green	Input 10
24V Pull Down *	Pin 15	white-yellow	Input 11
24V Pull Down *	Pin 16	brown-yellow	Input 12
	Pin 17		reserved for UNAX® handshake
	Pin 18		reserved for UNAX® handshake
	Pin 19		reserved for UNAX® handshake
	Pin 20		reserved for UNAX® handshake
24V Pull Down *	Pin 21	white-blue	Input 5
24V Pull Down *	Pin 22	brown-blue	Input 6
24V Pull Down *	Pin 23	white-red	Input 7
24V Pull Down *	Pin 24	brown-red	Input 8
2A	Pin 25	white-black	GND
250mA	Pin 26	brown-black	5V

* 24V Input with 2.7 kΩ pull down, Ri = 12,7 kΩ

USER I/O UNAX

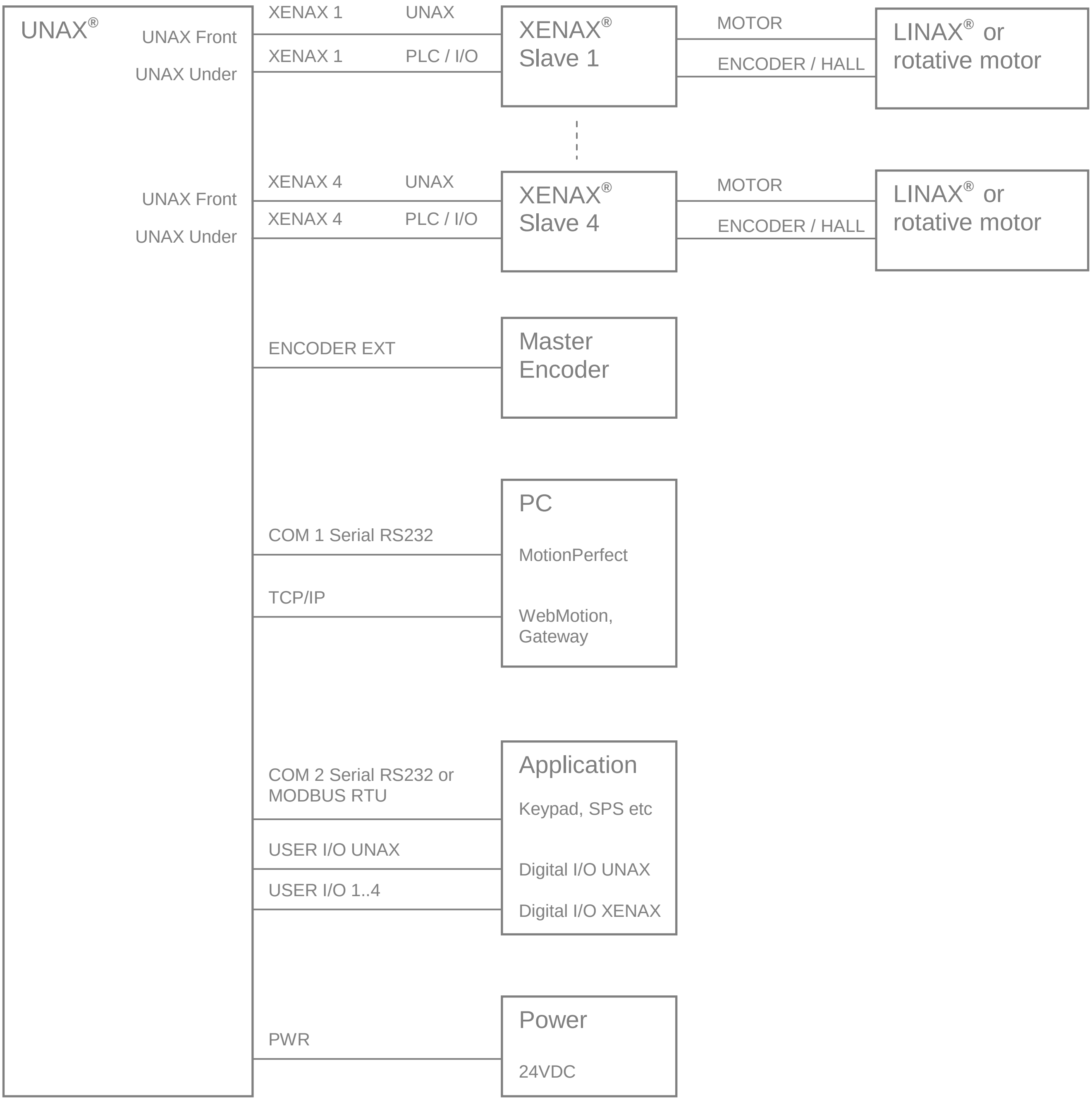
UNAX® I/O's, free programmable by application

Active low, NPN open collect. 24V/350mA, freewheel. diode	Pin 1	white	Output 1
Active low, NPN open collect. 24V/350mA, freewheel. diode	Pin 2	brown	Output 2
Active low, NPN open collect. 24V/350mA, freewheel. diode	Pin 3	green	Output 3
Active low, NPN open collect. 24V/350mA, freewheel. diode	Pin 4	yellow	Output 4
Active low, NPN open collect. 24V/350mA, freewheel. diode	Pin 5	grey	Output 5
Active low, NPN open collect. 24V/350mA, freewheel. diode	Pin 6	pink	Output 6
Active low, NPN open collect. 24V/350mA, freewheel. diode	Pin 7	blue	Output 7
Active low, NPN open collect. 24V/350mA, freewheel. diode	Pin 8	red	Output 8
24V Power supply voltage protected with 100mA poly-switch usable for input signal level	Pin 9	black	PWR
2A	Pin 10	violet	GND
2A	Pin 11	grey-pink	GND
250mA	Pin 12	red-blue	5V
	Pin 13		NC
	Pin 14		NC
	Pin 15		NC
	Pin 16		NC
24V Rin = 6.8k	Pin 17	white-grey	Input 0 / R0 [1]
24V Rin = 6.8k	Pin 18	brown -grey	Input 1 / R1 [1]
24V Rin = 6.8k	Pin 19	white-pink	Input 2 / R2 [1]
24V Rin = 6.8k	Pin 20	brown-pink	Input 3 / R3 [1]
24V Rin = 6.8k	Pin 21	white-blue	Input 4 / XENAX 3, OUT 3 [2]
24V Rin = 6.8k	Pin 22	brown-blue	Input 5 / XENAX 4, OUT 1 [2]
24V Rin = 6.8k	Pin 23	white-red	Input 6 / XENAX 4, OUT 2 [2]
24V Rin = 6.8k	Pin 24	brown-red	Input 7 / XENAX 4, OUT 3 [2]
2A	Pin 25	white-black	GND
250mA	Pin 26	brown-black	5V

[1] Free programmable inputs, registration inputs for position detection with an external encoder

[2] Free programmable inputs if XENAX 3 resp. XENAX 4 are not present.

2.2 System cabling



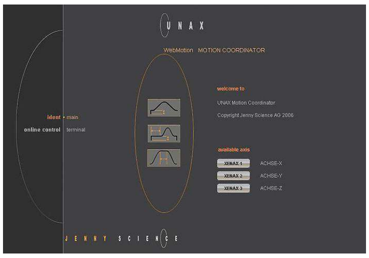
Note :
If the master encoder is connected (ENCODER EXT), connection XENAX 4 is not usable and must be disconnected.

3 Development Environment / Tools

The following tools are involved into programming a UNAX® system.

WebMotion®

Parameterisation and programming of XENAX® slave servo controllers



welcome to

UNAX Motion Coordinator

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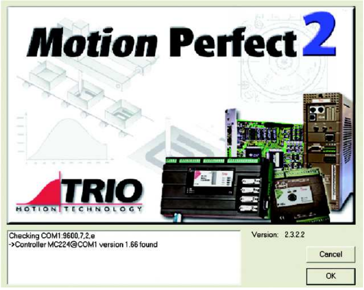
available axis

XENAX 1	ACHSE-X
XENAX 2	ACHSE-Y
XENAX 3	ACHSE-Z

Motion Perfect 2

Integrated development environment for application programming of the UNAX® multi-axis motion coordinator in BASIC syntax

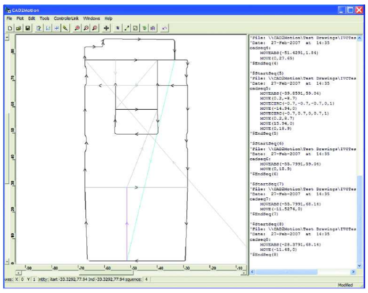


```
Checking COM1:9600,7,2,e
->Controller MC224@COM1 version 1.66 found
```

Version: 2.3.2.2

CAD to Motion

Import of CAD files with DXF-format. Automatically conversion to BASIC code for UNAX® application.

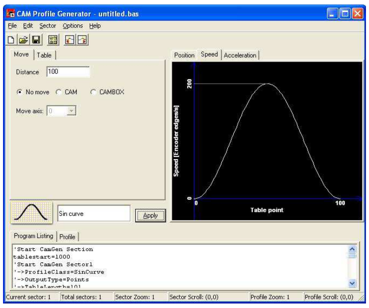


```
'File: \\CAD2Motion\Test Drawings\IVCTes
'Date:  27-Feb-2007  at  14:35
cadseq4:
    MOVEABS(-51.4291,1.84)
    MOVE(0,27.65)
'$EndSeq(4)

'$StartSeq(5)
'File: \\CAD2Motion\Test Drawings\IVCTes
'Date:  27-Feb-2007  at  14:35
cadseq5:
    MOVEABS(-39.8591,59.04)
    MOVE(0.2,-8.7)
    MOVECIRC(-0.7,-0.7,-0.7,0,1)
    MOVE(-14.94,0)
    MOVECIRC(-0.7,0.7,0,0.7,1)
    MOVE(0.2,8.7)
    MOVE(15.94,0)
    MOVE(0,18.9)
'$EndSeq(5)

'$StartSeq(6)
'File: \\CAD2Motion\Test Drawings\IVCTes
'Date:  27-Feb-2007  at  14:35
cadseq6:
    MOVEABS(-55.7991,59.04)
    MOVE(0,18.9)
'$EndSeq(6)

'$StartSeq(7)
'File: \\CAD2Motion\Test Drawings\IVCTes
'Date:  27-Feb-2007  at  14:35
cadseq7:
    MOVEABS(-55.7991,68.14)
    MOVE(-11.5274,0)
'$EndSeq(7)

'$StartSeq(8)
'File: \\CAD2Motion\Test Drawings\IVCTes
'Date:  27-Feb-2007  at  14:35
cadseq8:
    MOVEABS(-28.3791,68.14)
    MOVE(-11.48,0)
'$EndSeq(8)
```

xes: X 0 Y 1 ntity: tart -33.3292,77.94 nd -33.3292,77.94 equence: 4

Cam Gen

Tool to create CAM tables


CAM Profile Generator - untitled.bas
File Edit Sector Options Help
Move Table
Position Speed Acceleration
Speed [Encoder edges/s]
200
0
0
100
Table point
Apply
Program Listing Profile

Distance: 100

● No move ○ CAM ○ CAMBOX

Move axis: 0

Sin curve

```
'Start CamGen Section
tablestart=1000
'Start CamGen Sector1
'->ProfileClass=SinCurve
'->OutputType=Points
'->TableLength=101
```

Current sector: 1 | Total sectors: 1 | Sector Zoom: 1 | Sector Scroll: (0,0) | Profile Zoom: 1 | Profile Scroll: (0,0)

4 Programming XENAX® slave controller

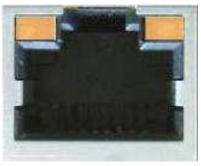
4.1 Ethernet connect

Connection of UNAX® to laptop/PC via Ethernet-switch with normal network cable RJ45.

For connection of the laptop / PC directly to UNAX® use a crossed cable RJ45. With newer network cards a crossed cable is not necessary any more.

LED status on Ethernet connector

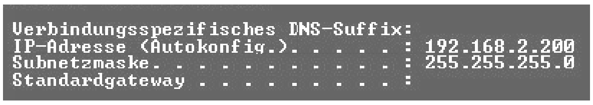
Colour	LED left	Colour	LED right
off	no connection	off	no data
orange	10Mbps	orange	half duplex
green	100Mbps	green	full duplex



4.2 Test IP with >IPCONFIG

IPCONFIG command in DOS window

Check the TCP/IP address range:
IP address of the PC must be in range of 192.168.2.xxx
If necessary adjust IP address manually via „network set up“, e.g. 192.168.2.200
xxx = 001 – 255 ≠ address UNAX®



```
Verbindungsspezifisches DNS-Suffix:
IP-Adresse (Autokonfig.). . . . . : 192.168.2.200
Subnetzmaske. . . . . . . . . . . : 255.255.255.0
Standardgateway . . . . . . . . . :
```

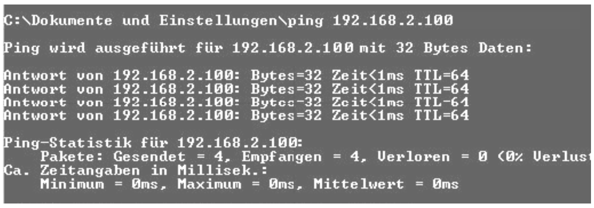
4.3 Test connection with >PING

PING command in DOS window

The IP address you will find at the back of UNAX®

If there is no answer, check direct connection with a crossed cable.

If you do not know the IP address of UNAX®, you can look for it with the DeviceInstaller tool. Make sure, that the Ethernet connection is operational.



```
C:\Dokumente und Einstellungen\ping 192.168.2.100

Ping wird ausgeführt für 192.168.2.100 mit 32 Bytes Daten:

Antwort von 192.168.2.100: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.2.100: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.2.100: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.2.100: Bytes=32 Zeit<1ms TTL=64

Ping-Statistik für 192.168.2.100:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0 (0% Verlus
Ca. Zeitangaben in Millisek.:
    Minimum = 0ms, Maximum = 0ms, Mittelwert = 0ms
```

4.4 IP address search / change

To view and change the IP address as well as to update WebMotion®, the DeviceInstaller tool is used.

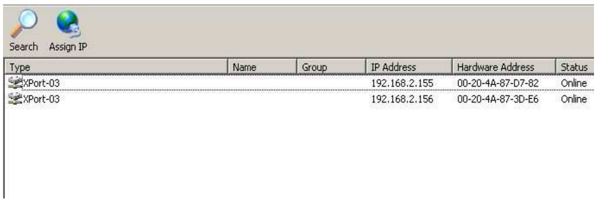
Use the adjacent link and click DeviceInstaller. Select the component XPort and install it.

http://www.lantronix.com/device-networking/utilities-tools/device-installer.html

The DeviceInstaller needs the Microsoft .NET framework driver. Should this driver not exist it can be downloaded by returning to the adjacent link Microsoft .NET Framework.

Search IP address of UNAX®

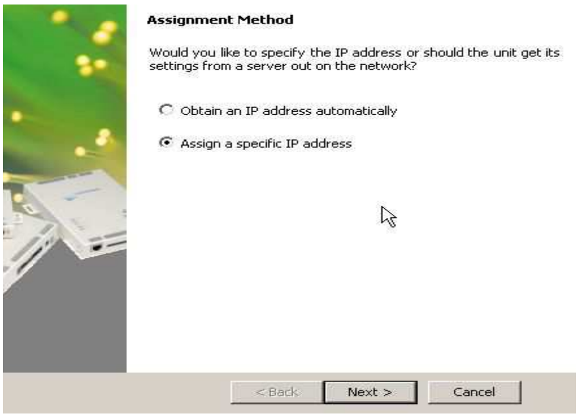
Start the DeviceInstaller tool of Lantronix and choose Search to look for existing IP addresses of XPorts.



Type	Name	Group	IP Address	Hardware Address	Status
XPort-03			192.168.2.155	00-20-4A-87-D7-82	Online
XPort-03			192.168.2.156	00-20-4A-87-3D-E6	Online

Change IP addresses

Via Assign IP you choose Assign a specific IP address. Now it is possible to set up a new IP address.



Assignment Method

Would you like to specify the IP address or should the unit get its settings from a server out on the network?

○ Obtain an IP address automatically

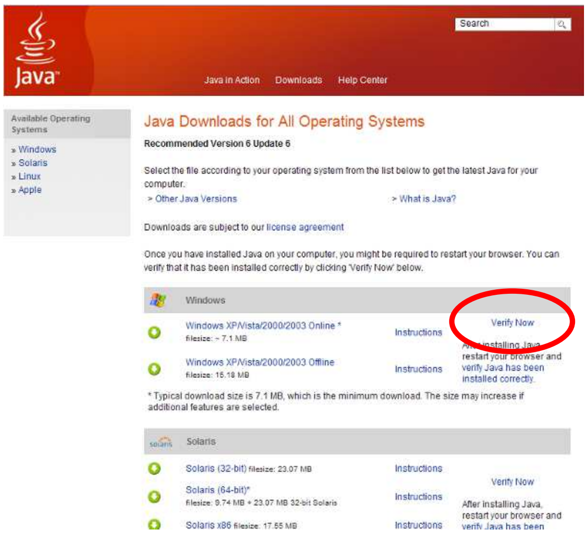
● Assign a specific IP address

4.5 JAVA Plugin check

In case of problems with the JAVA software you can execute a check with the link on right side.

http://www.java.com/de/download/manual.jsp

By selecting *Verify now* (marked red on right), your installed JAVA Plugin version will appear.



Available Operating Systems

» Windows
» Solaris
» Linux
» Apple

Java Downloads for All Operating Systems

Recommended Version 6 Update 6

Select the file according to your operating system from the list below to get the latest Java for your computer.

> Other Java Versions
> What is Java?

Downloads are subject to our license agreement

Once you have installed Java on your computer, you might be required to restart your browser. You can verify that it has been installed correctly by clicking 'Verify Now' below.

Windows

Windows XP/Vista/2000/2003 Online * filesize: ~ 7.1 MB	Instructions	Verify Now After installing Java, restart your browser and verify Java has been installed correctly.
Windows XP/Vista/2000/2003 Offline filesize: 15.18 MB	Instructions	

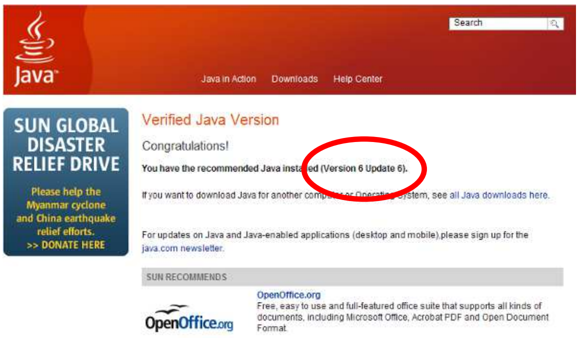
* Typical download size is 7.1 MB, which is the minimum download. The size may increase if additional features are selected.

Solaris

Solaris (32-bit) filesize: 23.07 MB	Instructions	Verify Now After installing Java, restart your browser and verify Java has been
Solaris (64-bit)* filesize: 9.74 MB + 23.07 MB 32-bit Solaris	Instructions	
Solaris x86 filesize: 17.55 MB	Instructions	

The version of JAVA Plugin Software must be 1.4 or higher.
The verified JAVA version is the first figure after the dot. The example on the right shows the version 1.6.

If a lower version is installed, it can be updated with a Java software download.
The current version of JAVA Runtime Environment (JRE) is also available on the enclosed CD.


Java
Search
Java in Action
Downloads
Help Center
SUN GLOBAL DISASTER RELIEF DRIVE
Please help the Myanmar cyclone and China earthquake relief efforts.
>> DONATE HERE

Verified Java Version

Congratulations!

You have the recommended Java installed (Version 6 Update 6).

If you want to download Java for another computer or Operating System, see all Java downloads here.

For updates on Java and Java-enabled applications (desktop and mobile),please sign up for the java.com newsletter.

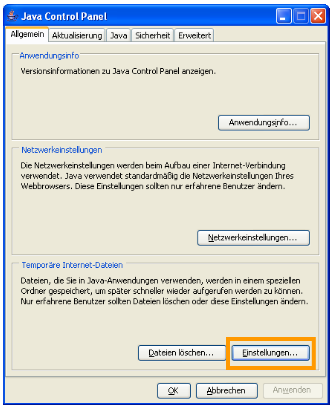
SUN RECOMMENDS

OpenOffice.org
Free, easy to use and full-featured office suite that supports all kinds of documents, including Microsoft Office, Acrobat PDF and Open Document Format.

4.6 Applet Cache

To provide a correct loading procedure of WebMotion® applet into the browser, caching functionality of java plugin must be switched off.

Otherwise the loading procedure can be unreliable.



Anwendungsinfo

Versionsinformationen zu Java Control Panel anzeigen.

Netzwerkeinstellungen

Die Netzwerkeinstellungen werden beim Aufbau einer Internet-Verbindung verwendet. Java verwendet standardmäßig die Netzwerkeinstellungen Ihres Webbrowsers. Diese Einstellungen sollten nur erfahrene Benutzer ändern.

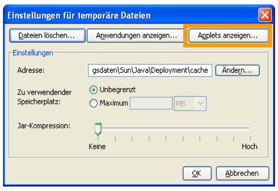
Temporäre Internet-Dateien

Dateien, die Sie in Java-Anwendungen verwenden, werden in einem speziellen Ordner gespeichert, um später schneller wieder aufgerufen werden zu können. Nur erfahrene Benutzer sollten Dateien löschen oder diese Einstellungen ändern.

Open Java Control Panel with:
start / systemcontrol (classic view) / java

temporary internet files / setup

change view to „show applets“

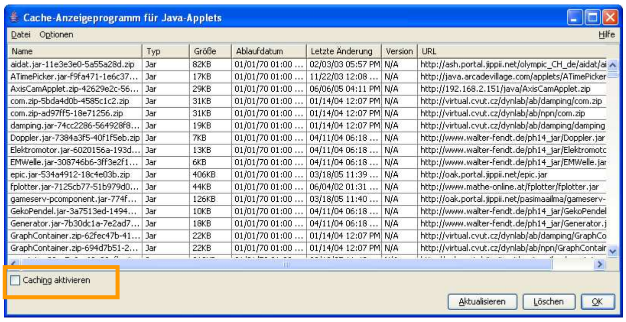


Einstellungen

Adresse: gsdaten\Sun\Java\Deployment\cache

Zu verwendender Speicherplatz: ● Unbegrenzt ○ Maximum MB

Jar-Kompression: Keine – Hoch

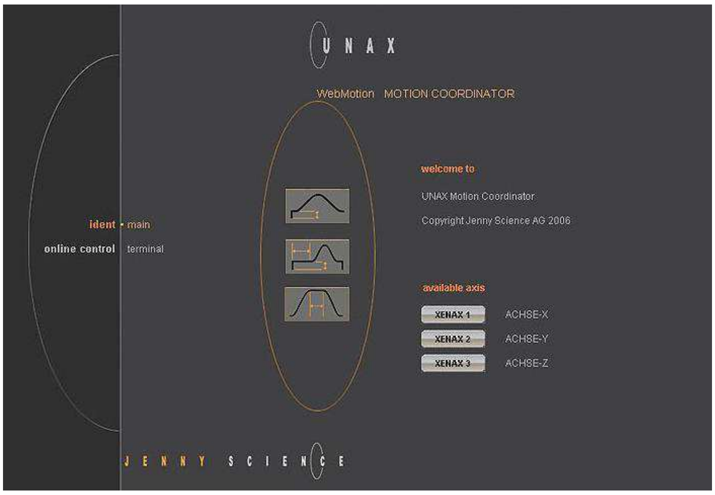


Name	Typ	Größe	Ablaufdatum	Letzte Änderung	Version	URL
aidat.jar-11e3e3e0-5a55a28d.zip	Jar	82KB	01/01/70 01:00 ...	02/03/03 05:57 PM	N/A	http://ash.portal.jippii.net/olympic_CH_de/aidat/ai
ATimePicker.jar-f9fa471-1e6c37...	Jar	17KB	01/01/70 01:00 ...	11/22/03 12:08 ...	N/A	http://java.arcadevillage.com/applets/ATimePicker
AxisCamApplet.zip-42629e2c-56...	Jar	29KB	01/01/70 01:00 ...	06/06/05 04:11 PM	N/A	http://192.168.2.151/java/AxisCamApplet.zip
com.zip-5bda4d0b-4585c1c2.zip	Jar	31KB	01/01/70 01:00 ...	01/14/04 12:07 PM	N/A	http://virtual.cvut.cz/dynlab/ab/damping/com.zip
com.zip-ad97ff5-18e71256.zip	Jar	31KB	01/01/70 01:00 ...	01/14/04 12:07 PM	N/A	http://virtual.cvut.cz/dynlab/ab/npn/com.zip
damping.jar-74cc2286-564928f8...	Jar	19KB	01/01/70 01:00 ...	01/14/04 12:07 PM	N/A	http://virtual.cvut.cz/dynlab/ab/damping/damping
Doppler.jar-7384a3f5-40f1f5eb.zip	Jar	7KB	01/01/70 01:00 ...	04/11/04 06:18 ...	N/A	http://www.walter-fendt.de/ph14_jar/Doppler.jar
Elektromotor.jar-6020156a-193d...	Jar	13KB	01/01/70 01:00 ...	04/11/04 06:18 ...	N/A	http://www.walter-fendt.de/ph14_jar/Elektromotc
EMWelle.jar-308746b6-3ff3e2f1...	Jar	6KB	01/01/70 01:00 ...	04/11/04 06:18 ...	N/A	http://www.walter-fendt.de/ph14_jar/EMWelle.jar
epic.jar-534a4912-18c4e03b.zip	Jar	406KB	01/01/70 01:00 ...	03/18/05 11:39 ...	N/A	http://oak.portal.jippii.net/epic.jar
fplotter.jar-7125cb77-51b979d0...	Jar	44KB	01/01/70 01:00 ...	06/04/02 01:31 ...	N/A	http://www.mathe-online.at/fplotter/fplotter.jar
gameserv-pcomponent.jar-774f...	Jar	126KB	01/01/70 01:00 ...	03/18/05 11:40 ...	N/A	http://oak.portal.jippii.net/pasimaailma/gameserv-
GekoPendel.jar-3a7513ed-1494...	Jar	10KB	01/01/70 01:00 ...	04/11/04 06:18 ...	N/A	http://www.walter-fendt.de/ph14_jar/GekoPendel
Generator.jar-7b30dc1a-7e2ad7...	Jar	18KB	01/01/70 01:00 ...	04/11/04 06:18 ...	N/A	http://www.walter-fendt.de/ph14_jar/Generator.j
GraphContainer.zip-62fec47b-41...	Jar	22KB	01/01/70 01:00 ...	01/14/04 12:07 PM	N/A	http://virtual.cvut.cz/dynlab/ab/damping/GraphCo
GraphContainer.zip-694d7b51-2...	Jar	22KB	01/01/70 01:00 ...	01/14/04 12:07 PM	N/A	http://virtual.cvut.cz/dynlab/ab/npn/GraphContair

☐ Caching aktivieren

The checkbox must be switched off

4.7 WebMotion®



welcome to

UNAX Motion Coordinator

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WebMotion® is an integrated graphic user interface into UNAX® device, based on web technology (applet), to parameterisation and programming of XENAX® slave servo controllers.

Standard web browsers like Internet Explorer, Mozilla, Firefox, Opera and so on are able to load and execute the WebMotion® applet.

Start web browser with the IP address (back side of UNAX®) with extension /unax.html

http://192.168.2.xxx/unax.html

The main site of UNAX® shows the available XENAX® servo controllers (XENAX 1..n).

After selection of a servo controller, the graphic user interface looks like a peer to peer connection to a standard XENAX® servo controller. Parameterisation and programming can be done.

Return to UNAX® main site occurs by the button exit in menu ident/main of WebMotion®

Note:

After switching on the UNAX® power supply, wait at least 10 seconds until the UNAX® web server is ready for operating. Only afterwards start the browser with WebMotion®.

On interruption of the UNAX® power supply, please exit the browser. When turning on wait 10 seconds again before restarting the browser with WebMotion®.

Further information of WebMotion® is included into XENAX® user manual.

4.8 Set up XENAX® for operation with UNAX®

For operation of the XENAX® servo controller with the UNAX® multi-axis coordinator, following parameters must be set:

MODE	2	Operation mode stepper control
INC PER PULSE	1	Increment per Pulse count. Together with the definition UNIT = 16 into UNAX® application, all move commands into UNAX® program are based on µm units. 1 INC = 1 µm

Input Functions

The UNAX® multi-axis motion coordinator is able to control four digital inputs (Input 1..4) of each connected XENAX® slave servo controller.

This inputs must be defined as Input Functions on XENAX® slave servo controller to take effect (for detailed information, see manual XENAX®).

Recommended programming:

Input Function 1 (PG1)

Initialisation of the XENAX® slave servo axis (HORM) and motion to a defined start position (IX).

HORM must be executed just once after switching on the servo controller.
The successful HORM sequence can be sent to UNAX® via digital Output of XENAX® slave servo controller

Input Function 2 (EE)

Stop with Emergency Exit (EE). The power stage of XENAX® slave servo controller will be switched off.

Input Function 3, 4

free programmable, additional motion indexes for example

Output Functions

Each XENAX® slave servo controller can send status information to the UNAX® by three digital outputs (Output 1..3)

Examples:
Homing sequence done, error, position reached

5 Programming the UNAX® multi-axis coordinator

5.1 Motion Perfect 2

Integrated development environment for programming the UNAX multi-axis motion coordinator.
Up to five multi threading tasks are programmable in Trio BASIC Syntax.

To get detailed information about installation and handling, please see the manual *MotionPerfect.pdf* on CD.

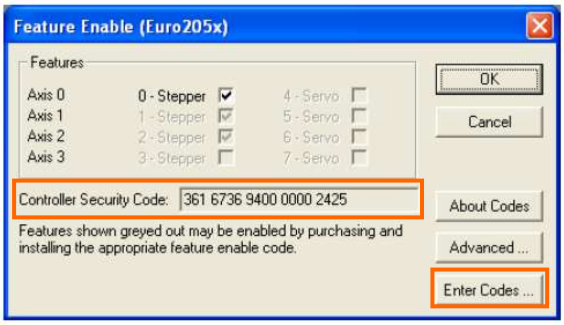
```
Checking COM1:9600,7,2,e
->Controller MC224@COM1 version 1.66 found
```

Version: 2.3.2.2

5.2 Axis configuration

The UNAX® multi-axis motion coordinator is able to coordinate up to four axes.
The actual axis configuration is listed in the menu *Controller / enable features*

To enable additional axes (up to 4), send the controller security code to Jenny Science. Then you will get an activation code to enter in the menu *Enable / Enter Codes*



Axis 0 — 0 - Stepper ☑ — 4 - Servo ☐
Axis 1 — 1 - Stepper ☑ — 5 - Servo ☐
Axis 2 — 2 - Stepper ☑ — 6 - Servo ☐
Axis 3 — 3 - Stepper ☐ — 7 - Servo ☐

Controller Security Code: 361 6736 9400 0000 2425

Features shown greyed out may be enabled by purchasing and installing the appropriate feature enable code.

5.3 BASIC command set

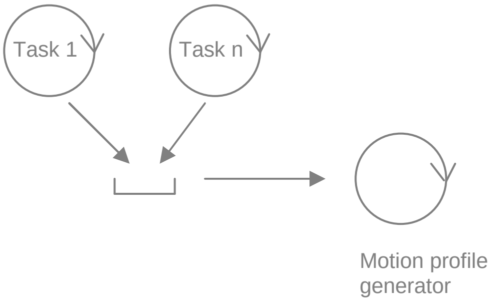
The programming language of UNAX® is a BASIC Syntax with specific command set.

For detailed information, please see the document *Programming.pdf* and chapter *8 Trio Basic commands* in full manual

5.4 Tasks and motion profile generator

Each task writes the motion commands into an input buffer system of the motion profile generator.
(MTYPE, NTYPE, PMOVE, see TrioBasic commands)

To synchronise on a specific task program line, the command WAIT IDLE is used.
For example, set an output after a motion profile is finished



5.5 System module UNAX_SYS.bas

Software task with defined user interface to control the hardware outputs of UNAX®

The control interface includes the global variables VR(0..3), see also document *Programming.pdf*

VR(0)	USER I/O UNAX
VR(1)	XENAX 1 / 2
VR(2)	XENAX 3 / 4
VR(3)	7 segment LED

Important:

The command OP (Output) is reserved for the software task UNAX_SYS. Do not use OP in the user application.

5.6 User I/O UNAX

I/O interface of UNAX®, freely programmable into user application.

Make sure that UNAX_SYS is running

Set Outputs

Output No	Pin No	**VR(0)** Bit No	valency
1	1	0	1
2	2	1	2
3	3	2	4
4	4	3	8
5	5	4	16
6	6	5	32
7	7	6	64
8	8	7	128

Output control works via global variable VR(0). Depending on output combination, the sum of valency must be written into VR(0).

Example 1

Set outputs 1,6,7 for a duty cycle of 10 ms.

```
VR(0) = 97
WA(10)
VR(0) = 0
```

Example 2

Set output 4 only:

Output 4 means Bit Nr.3 of VR(0), so SET_BIT(3,0), in the same way CLEAR_BIT(3,0) in case to clear output.

Read Inputs

Inputs 0..7 are mirrored in BASIC variable IN. With the bit number as parameter, test of a specific input is possible.

Example:

Program branch through logic combination of Input 3 (Pin 20) AND Input 5 (Pin 22)

```
IF (IN(3)=ON AND IN(5)=ON) THEN
GOTO inp_on
ELSE
GOTO inp_off
ENDIF
```

Important:

If XENAX 3 is connected, IN Bit 4 is used for UNAX® handshake with XENAX® slave servo controller. Therefore, USER I/O UNAX input 4 is busy. In the same way, inputs 5..7 of USER I/O UNAX are busy, if XENAX 4 is connected.

5.7 XENAX® handshake with UNAX®

Each XENAX® slave servo controller is connected via ribbon cable with UNAX® multi-axis motion coordinator.
(Connector XENAX 1..4 on underside of UNAX®).

Make sure that UNAX_SYS is running

Set inputs on XENAX® slave servo controller

UNAX® is able to control Input 1..4 of each connected XENAX® slave servo controller.
So, input functions on XENAX® can be triggered from UNAX® (homing, programs or indexes for example)

XENAX Nr	Input Nr	**VR(1)** Bit Nr	valency
1	1	0	1
	2	1	2
	3	2	4
	4	3	8
2	1	4	16
	2	5	32
	3	6	64
	4	7	128

XENAX Nr	Input Nr	**VR(2)** Bit Nr	valency
3	1	0	1
	2	1	2
	3	2	4
	4	3	8
4	1	4	16
	2	5	32
	3	6	64
	4	7	128

Example
Assumption: Two XENAX® slave servo controller (XENAX 1, 2) are connected with UNAX®. The homing function has to be triggered via Input 1 on each controller at the same time.

```
VR(1)=17
WA(100)
VR(1)=0
```

In case of three XENAX® slave servo controller (XENAX 1,2,3)

```
VR(1)=17
VR(2)=1
WA(100)
VR(1)=0
VR(2)=0
```

Read outputs from XENAX® slave servo controller

UNAX® can read the digital outputs 1..3 of each connected XENAX® slave servo controller.

XENAX Nr	Output Nr	**IN** Bit Nr
1	1	8
	2	9
	3	10
2	1	11
	2	12
	3	13
3	1	14
	2	15
	3	4*
4	1	5*
	2	6*
	3	7*

Example:

Assumption: Each XENAX® slave servo controller sets output function 1 (HOME), if the homing sequence is finished successfully.
The application has to wait, until the homing sequence of XENAX 1 and XENAX 2 is finished.

```
wait_ho:
IF (IN(8) = OFF OR IN(11) = OFF) THEN
GOTO wait_ho
ENDIF
```

*** Important:**

If XENAX 3 is connected, IN Bit 4 is used for UNAX® handshake with XENAX® slave servo controller. Therefore, USER I/O UNAX input 4 is busy. In the same way, inputs 5..7 of USER I/O UNAX are busy, if XENAX 4 is connected.

Control 7-segment LED display

The 7-segment display of UNAX® is free programmable by the user application. It can be used for application specific status information.

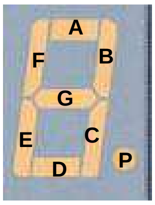
display 0..9, A..F

LED digits/character	**VR(3)** value
0..9	0..9
A	10
B	11
C	12
D	13
E	14
F	15

segment control

If value VR(3)>15 then segment control with offset value = 16 is activated.

LED segment	val
blank	0
segment F	1
segment G	2
segment E	4
segment D	8
segment C	16
segment B	32
segment A	64
point	128



VR(3) = val + 16

Examples:

Display	VR(3)
digit 5	5
character E	14
segment G	18
character P	119

5.8 COM 1 / COM 2 Interface

COM 1
Internal connected to Euro 205x, port 0.
Serial ASCII command interface of Euro205x, MotionPerfect2 interface

All commands of TRIO BASIC command set can be used (see document *CommandReference.pdf*)

Protocol
Each response of Euro205x is terminated with [CR][LF]>>
Values of variables can be requested by prefix „?“

Examples
Request global variable VR(5):
?VR(5)
1.2345[CR][LF]>>

Set global variable VR(3) with value=12:
VR(3)=12

Read axis 0 parameter acceleration:
BASE(0)
?ACCEL

COM 2
Internal connected to Euro 205x, port 1.
This serial interface is free programmable by the application.

PRINT
Send string

INPUT
Waits for a string to be received, terminated with a carriage return <CR>

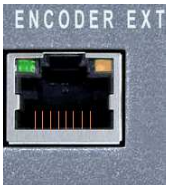
Optionally, MODBUS RTU can be defined with command SETCOM to connect adapted keypads or HMI.
(see also document *full manual6.7.pdf* chapter 13-3)

5.9 External Encoder

The UNAX® application can read a master axis via external encoder connector.

The command MPOS returns the current encoder position.

Example:
CurrentPos = MPOS AXIS(3)



Note:
If less than four stepper axes are configured (see chapter *5.2 axis configuration*), the fourth axis automatically works in ENCODER EXT mode, ATYPE AXIS(3) = 3.
Make sure that connector XENAX 4 is not connected.

If the fourth axis is enabled, the axis type must be set explicit into UNAX® application with ATYPE AXIS(3) = 1 (stepper axis)

6 Application example

An easy example shows the basic mechanism of programming a UNAX® system.

The user gets a quick and efficient insight of the UNAX® programming and is able to develop real applications with the aid of a substantial documentation.

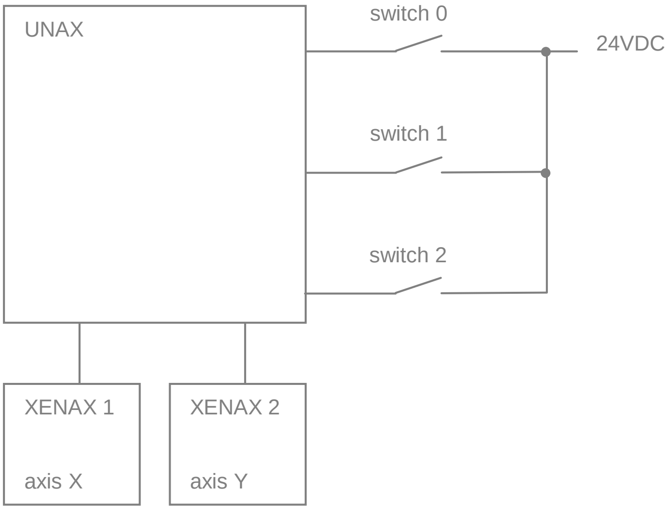
6.1 Exercise

The UNAX® system includes two XENAX® slave servo controllers with LINAX® linear stages in XY-cross table configuration.

XENAX 1	axis X
XENAX 2	axis Y

Three switches are connected to the USER I/O UNAX® interface.

switch 0	Pin 17	0=	start
		1=	stop
switch 1	Pin 18	0=	curve-8
		1=	CAD-curve
switch 2	Pin 19	1=	reset



Functionality of the program example

After power ON of the UNAX® system, reset and homing sequence of both axes must be done.

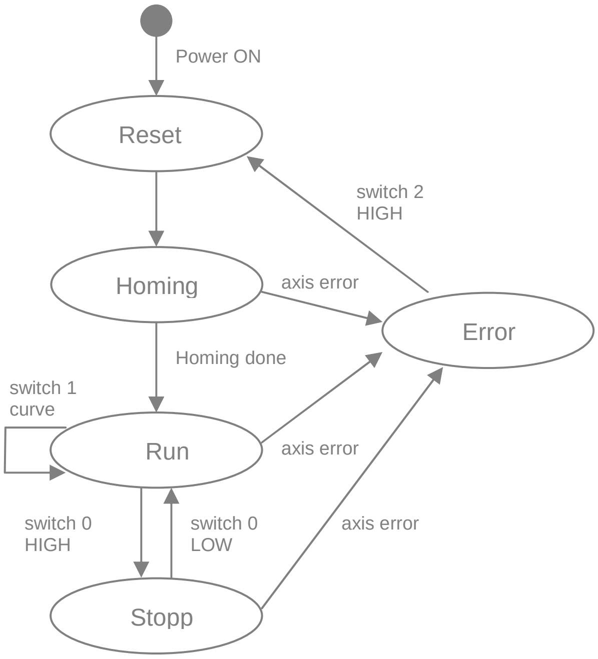
The homing sequence includes the initialisation of the axis (HORM) as well as positioning the slide in middle position.

Afterwards, the motion starts according selected curve through switch 1.

0	curve of an „8“
1	imported CAD curve

Switch 0 stops the motion in middle position.

In case of an axis error (display „E“ on UNAX®), switch 2 starts the reset sequence and the application restarts again.



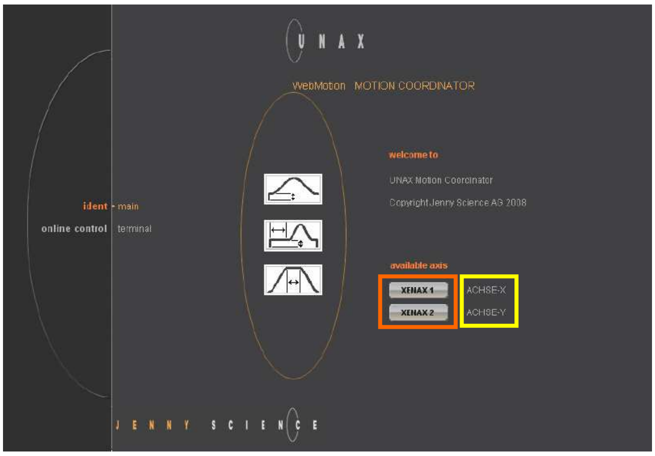
6.2 Parameterisation XENAX® slave servo controller

The parameterisation and programming of the XENAX® slave servo controllers can be done centrally via integrated web application WebMotion® inside of UNAX®.

start browser with URL:
http://192.168.2.100/Unax.html

Note:
The UNAX® probably does not have the standard IP address 192.168.2.100, therefore the URL has to be adapted to the current IP address of UNAX®.
If the IP address of UNAX® is unknown, the tool *Device Installer* is able to scan for it.

The two available axes into the UNAX® system are shown on the start site with buttons XENAX 1 and XENAX 2.



welcome to

UNAX Motion Coordinator

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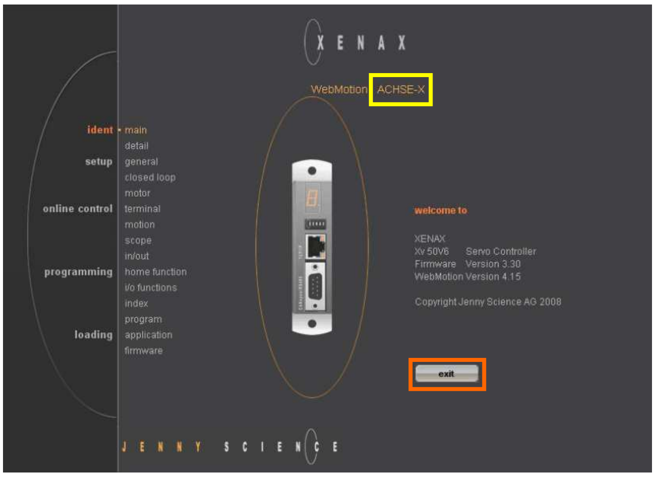
With the selection of an axis, WebMotion® looks like a peer to peer connection to a standard XENAX® servo controller.
In the menu *ident/main*, the button *exit* returns to UNAX® start site.

Each connected XENAX® slave servo controller can be labelled with a user defined string.

The corresponding command is SID (Servo IDentification), entered in menu *online control / terminal* (see also Xenax® manual chapter *ASCII command set*)

Example
Define axis identification „ACHSE-X“
command: SIDACHSE-X



welcome to

XENAX
Xv 50V6 Servo Controller
Firmware Version 3.30
WebMotion Version 4.15

Copyright Jenny Science AG 2008

Homing

The Homing Sequence has to be defined on both XENAX® slave servo controller with Program 1.
Afterwards index 1 drives to the absolute middle position of the LINAX® stage (assumption Linax LX-44)
Output 1 indicates the completition of the homing sequence to UNAX®.

Programm 1

Line 1	CO	1	Clear Output 1
Line 2	HORM		Home Ref Mark
Line 3	IX	1	Index 1
Line 4	SO	1	Set Output 1

Index 1

Acceleration	1000000
Speed	10000
Distance	22000
Abs/Rel	Abs

Input Function 1

PG1 (Programm 1)

Reset

Reset of XENAX® slave servo controller is programmed as an Input function EE (Emergency Exit). The power stage is switched off.

Input Function 2

EE (Emergency Exit)

Error

UNAX® must be able to detect axis errors. Therefore, the Output Function 2 (Error) of each XENAX® slave servo controller must be supervised by UNAX®.

Output Function 2

ERR (Error)

Parameterisation for UNAX® operation

To support the Pulse/Direction interface of UNAX® correctly, XENAX® slave controllers must be set into stepper mode control (WebMotion menu *setup / general*):

Mode	2
INC per Pulse	1

6.3 UNAX® application

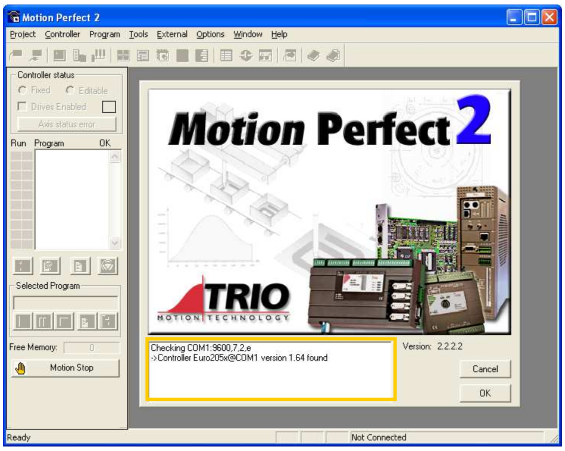
The programming of UNAX® multi-axis motion coordinator is supported by the integrated development environment *Motion Perfect 2*. For detailed information, please see manual MotionPerfect.pdf on CD.

Create new project

The start screen of Motion Perfect 2 shows hardware- and firmware identification of Euro205x board inside of UNAX®.

In this case, the communication is established and the tool ready for operation.

Otherwise, check the cabling and baudrate settings.

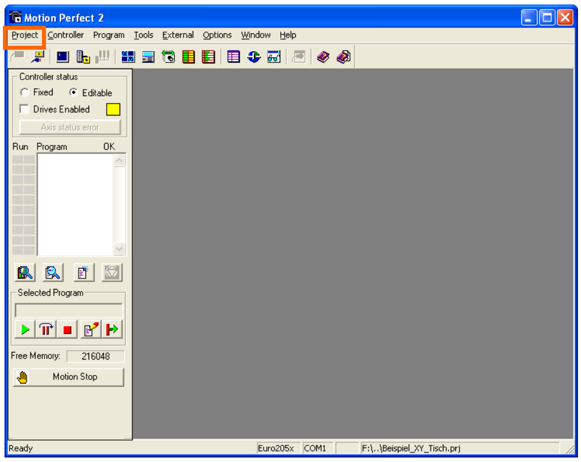


Checking COM1:9600,7,2,e
->Controller Euro205x@COM1 version 1.64 found

Version: 2.2.2.2

Create a new Project folder in Project / New project

The project file has the extension *.prj



Free Memory: 216048

Euro205x COM1 F:\..\Beispiel_XY_Tisch.prj

Include UNAX® systemtask

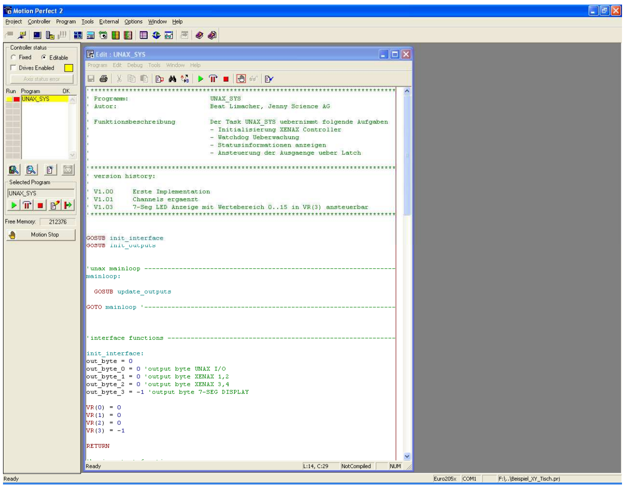
UNAX® systemtask is used for hardware control of UNAX®.

Copy *UNAX_SYS.bas* into project folder

Load UNAX_SYS.bas in menu *Project / Load Program File* into the project

With double click on *UNAX_SYS*, the source code will be shown.

Note:
Please do not modify the file *UNAX_SYS.BAS.* It is supported by JennyScience AG.



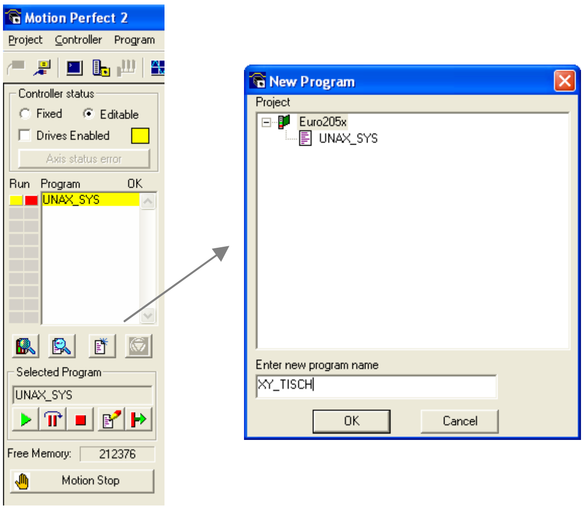
```
'**************************************************************************
' Programm:                       UNAX_SYS
' Autor:                          Beat Limacher, Jenny Science AG
'
' Funktionsbeschreibung           Der Task UNAX_SYS uebernimmt folgende Aufgaben
'                                 - Initialisierung XENAX Controller
'                                 - Watchdog Ueberwachung
'                                 - Statusinformationen anzeigen
'                                 - Ansteuerung der Ausgaenge ueber Latch
'
'**************************************************************************
' version history:
'
' V1.00     Erste Implementation
' V1.01     Channels ergaenzt
' V1.03     7-Seg LED Anzeige mit Wertebereich 0..15 in VR(3) ansteuerbar
'**************************************************************************


GOSUB init_interface
GOSUB init_outputs


'unax mainloop -----------------------------------------------------------
mainloop:

  GOSUB update_outputs

GOTO mainloop '-----------------------------------------------------------



'interface functions -----------------------------------------------------

init_interface:
out_byte = 0
out_byte_0 = 0 'output byte UNAX I/O
out_byte_1 = 0 'output byte XENAX 1,2
out_byte_2 = 0 'output byte XENAX 3,4
out_byte_3 = -1 'output byte 7-SEG DISPLAY

VR(0) = 0
VR(1) = 0
VR(2) = 0
VR(3) = -1

RETURN
```

Create application task

In the following chapters, the application is build up step by step with the matching descriptions.

First step, we add a new task into the project.

Click on the button 🗎 to open the filedialog and create a new application task "XY_TISCH.BAS".



Enter new program name: XY_TISCH

Program framework (XY_TISCH_1.bas)

The framework can be written into the program editor.

Note:
The program steps are included on CD in UNAX_Programmierung / Beispielprogramm / Beispiel_XY_Tisch
The files can be loaded in the menu *Project / load program file*

Description

RUN „UNAX_SYS"
Make sure the systemtask UNAX_SYS is running before the control variables VR(0..3) are modified.

MICROSTEP=OFF
Defined for stepper control, do not modify

UNITS AXIS(x) = 16
Setting needed for general UNAX® distance unit of 1 µm

MERGE = ON
Merge of consecutive moves. The axis will not ramp down to zero between the moves.
The functionality can disabled by MERGE = OFF

```
'***************************************************************************
' Programm:                         Beispielapplikation XY Tisch
' Autor:                            Jenny Science AG
'***************************************************************************


RUN "UNAX_SYS"
WA(500) 'warten auf systemtask

MICROSTEP=OFF 'Mikrostep Modus

MERGE=ON , Aneinanderreihung von Fahrbefehlen ohne Verzögerungsrampen

UNITS AXIS(0) = 16 'Achsparameter Achse 0 setzen
SPEED AXIS(0) = 20000
ACCEL AXIS(0) = 10000000
DECEL AXIS(0) = 10000000

UNITS AXIS(1) = 16 'Achsparameter Achse 1 setzen
SPEED AXIS(1) = 20000
ACCEL AXIS(1) = 10000000
DECEL AXIS(1) = 10000000


VR(0)= 0 'alle Ausgaenge von USER I/O UNAX loeschen
VR(1)= 0 'alle Inputs zu XENAX 1,2 loeschen
VR(2)= 0 'alle Inputs zu XENAX 3,4 loeschen
VR(3)= 0 '7-Seg Anzeige auf 0 setzen


WHILE 1=1 '---------------HAUPTLOOP----------------------------------------


WEND '-------------------------------------------------------------------------
```

Start program

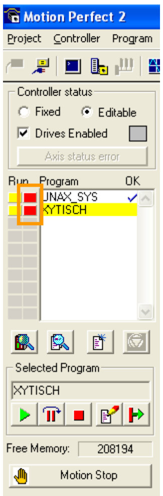
Click on the red colored square of XY_TISCH resp. XY_TISCH_1, if the color changes to green, the task is running.

Task UNAX_SYS starts through XY_TISCH

The functionality is shown by a „0" on the UNAX® 7-segment display. Tests with other values are possible, values 0..15 into VR(3).

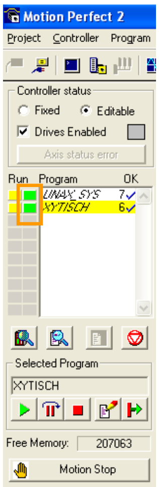
Stop program

To stop all the tasks, click on the green squares. The source code can be modified only if all tasks are stopped.



Free Memory: 208194

Tasks stopped



Free Memory: 207063

Tasks running

Reset / Homing (XY_TISCH_2.bas)

The input function 2 of XENAX® slave servo controller is defined as Emergency Exit (EE). To trigger this reset function, a signal pulse is required on input 2 of both servo controllers.

In the same way, the homing sequence is defined on input function 1.

See also chapter
5.7 XENAX® handshake with UNAX® / Set inputs on XENAX® slave servo controller

```
'**************************************************************************
' Programm:                     Beispielapplikation XY Tisch
' Autor:                        Jenny Science AG
'**************************************************************************

CONSTANT "state_reset",1
CONSTANT "state_homing",2
CONSTANT "state_run",3

RUN "UNAX_SYS"
WA(500) 'warten auf systemtask

MICROSTEP=OFF 'Mikrostep Modus

MERGE=ON 'Fahrbefehle werden aneindandergereiht ohne Verzoegerungsrampen

UNITS AXIS(0) = 16 'Achsparameter Achse 0 setzen
SPEED AXIS(0) = 20000
ACCEL AXIS(0) = 10000000
DECEL AXIS(0) = 10000000

UNITS AXIS(1) = 16 'Achsparameter Achse 1 setzen
SPEED AXIS(1) = 20000
ACCEL AXIS(1) = 10000000
DECEL AXIS(1) = 10000000


VR(0)= 0 'alle Ausgaenge von USER I/O UNAX loeschen
VR(1)= 0 'alle Inputs zu XENAX 1,2 loeschen
VR(2)= 0 'alle Inputs zu XENAX 3,4 loeschen
VR(3)= 0 '7-Seg Anzeige auf 0 setzen

VR(10) = state_reset ' Status der Applikation


WHILE 1=1 '----------------HAUPTLOOP---------------------------------------

  ON VR(10) GOSUB do_reset, do_homing, do_run

WEND '---------------------------------------------------------------------


do_reset:
  VR(1)=34 'Input 2 setzen bei XENAX 1,2 -> Input Function EE ausloesen
  WA(100)
  VR(1)=0 'alle Inputs zu XENAX 1,2 deaktivieren
  WA(1000)

  VR(1)=VR(1) OR $11 'Input 1 setzen bei XENAX 1,2 -> Input Funct. PG1, Homing
  WA(100)
  VR(1)=VR(1) AND $EE 'Input 1 loeschen bei XENAX 1,2
  VR(3) = 1 '7-Seg Anzeige UNAX auf 1 setzen
  VR(10)=state_homing
RETURN


do_homing:
  IF (IN(8)=ON AND IN(11)=ON) THEN 'Output 1 lesen von XENAX 1,2 Homing fertig ?
    VR(10)=state_run
  ENDIF
RETURN


do_run:

RETURN
```

Drive motion path of an “8” (XY_TISCH_3.bas)

DEFPOS(0,0)
Sets internal position counter of the interpolator to zero.

WDOG = ON
Enables power stage of UNAX® pulse / direction interface.

BASE(0,1)
Used to direct subsequent motion commands and axis parameter reads/writes to a particular axis, or group of axes.

MOVEABS(0,0)
Absolute position move to start position

MOVECIRC()
Circular move with two orthogonal axes. (see command reference for detailed information)

WAIT IDLE
Suspend program execution until the base axis has finished executing its current move and any further buffered move.

```
'*****************************************************************************
' Programm:                      Beispielapplikation XY Tisch
' Autor:                         Jenny Science AG
'*****************************************************************************

CONSTANT "state_reset",1
CONSTANT "state_homing",2
CONSTANT "state_run",3

RUN "UNAX_SYS"
WA(500) 'warten auf systemtask

MICROSTEP=OFF 'Mikrostep Modus

MERGE=ON 'Fahrbefehle werden aneindandergereiht ohne Verzoegerungsrampen

UNITS AXIS(0) = 16 'Achsparameter Achse 0 setzen
SPEED AXIS(0) = 20000
ACCEL AXIS(0) = 10000000
DECEL AXIS(0) = 10000000

UNITS AXIS(1) = 16 'Achsparameter Achse 1 setzen
SPEED AXIS(1) = 20000
ACCEL AXIS(1) = 10000000
DECEL AXIS(1) = 10000000


VR(0)= 0 'alle Ausgaenge von USER I/O UNAX loeschen
VR(1)= 0 'alle Inputs zu XENAX 1,2 loeschen
VR(2)= 0 'alle Inputs zu XENAX 3,4 loeschen
VR(3)= 0 '7-Seg Anzeige auf 0 setzen

VR(10) = state_reset ' Status der Applikation


WHILE 1=1 '----------------HAUPTLOOP------------------------------------------

  ON VR(10) GOSUB do_reset, do_homing, do_run

WEND '-----------------------------------------------------------------------


do_reset:
  VR(1)=34 'Input 2 setzen bei XENAX 1,2 -> Input Function EE ausloesen
  WA(100)
  VR(1)=0 'alle Inputs zu XENAX 1,2 deaktivieren
  WA(1000)

  VR(1)=VR(1) OR $11 'Input 1 setzen bei XENAX 1,2 -> Input Funct. PG1, Homing
  WA(100)
  VR(1)=VR(1) AND $EE 'Input 1 loeschen bei XENAX 1,2
  VR(3) = 1 '7-Seg Anzeige UNAX auf 1 setzen
  VR(10)=state_homing
RETURN


do_homing:
  IF (IN(8)=ON AND IN(11)=ON) THEN 'Output 1 lesen von XENAX 1,2 Homing fertig ?
    DEFPOS (0,0) 'Homing abgeschlossen, absolute Position in UNAX nullen
    WDOG=ON 'Endstufe UNAX freischalten fuer Puls-Richtungsansteuerung
    BASE(0,1) 'Definition der Achsgruppe fuer Fahrbefehle
    VR(10)=state_run
  ENDIF
RETURN


do_run:
   VR(3) = 2 '7-Seg Anzeige UNAX auf 2 setzen
   MOVEABS(0,0) '8-Kurve
   MOVECIRC(0,0,0,10000,0)
   MOVECIRC(0,0,0,-10000,1)
   WAIT IDLE
RETURN
```

Start / Stop functionality (XY_TISCH_4.bas)

The motion execution can be stopped by input 0 (Pin17) of USER I/O UNAX interface.

IN returns the value of the digital inputs of the UNAX®.

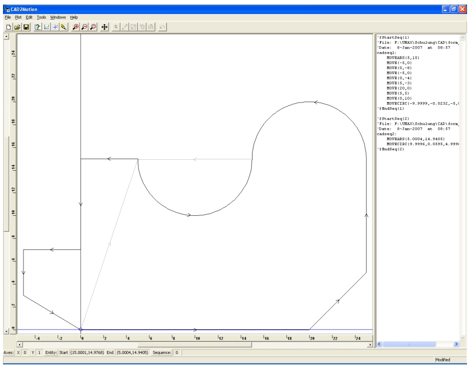
For detailed information, see chapter *5.6 User I/O UNAX/ Read inputs*

```
'****************************************************************************
' Programm:                     Beispielapplikation XY Tisch
' Autor:                        Jenny Science AG
'****************************************************************************

CONSTANT "state_reset",1
CONSTANT "state_homing",2
CONSTANT "state_run",3
CONSTANT "state_stop",4

RUN "UNAX_SYS"
WA(500) 'warten auf systemtask

MICROSTEP=OFF 'Mikrostep Modus

MERGE=ON 'Fahrbefehle werden aneindandergereiht ohne Verzoegerungsrampen

UNITS AXIS(0) = 16 'Achsparameter Achse 0 setzen
SPEED AXIS(0) = 20000
ACCEL AXIS(0) = 10000000
DECEL AXIS(0) = 10000000

UNITS AXIS(1) = 16 'Achsparameter Achse 1 setzen
SPEED AXIS(1) = 20000
ACCEL AXIS(1) = 10000000
DECEL AXIS(1) = 10000000


VR(0)= 0 'alle Ausgaenge von USER I/O UNAX loeschen
VR(1)= 0 'alle Inputs zu XENAX 1,2 loeschen
VR(2)= 0 'alle Inputs zu XENAX 3,4 loeschen
VR(3)= 0 '7-Seg Anzeige auf 0 setzen

VR(10) = state_reset ' Status der Applikation


WHILE 1=1 '----------------HAUPTLOOP-----------------------------------------

  ON VR(10) GOSUB do_reset, do_homing, do_run, do_stop

WEND '-----------------------------------------------------------------------


do_reset:
  VR(1)=34 'Input 2 setzen bei XENAX 1,2 -> Input Function EE ausloesen
  WA(100)
  VR(1)=0 'alle Inputs zu XENAX 1,2 deaktivieren
  WA(1000)

  VR(1)=VR(1) OR $11 'Input 1 setzen bei XENAX 1,2 -> Input Funct. PG1,Homing
  WA(100)
  VR(1)=VR(1) AND $EE 'Input 1 loeschen bei XENAX 1,2
  VR(3) = 1 '7-Seg Anzeige UNAX auf 1 setzen
  VR(10)=state_homing
RETURN


do_homing:
  IF (IN(8)=ON AND IN(11)=ON) THEN 'Output 1 lesen von XENAX 1,2 Homing fertig ?
    DEFPOS (0,0) 'Homing abgeschlossen, absolute Position in UNAX nullen
    WDOG=ON 'Endstufe UNAX freischalten fuer Puls-Richtungsansteuerung
    BASE(0,1) 'Definition der Achsgruppe fuer Fahrbefehle
    VR(10)=state_run
  ENDIF
RETURN


do_run:
  IF (IN(0)=ON) THEN 'USER I/O UNAX Eingang 0 (Stoptaste) gesetzt ?
    VR(10)=state_stop
  ELSE
    VR(3) = 2 '7-Seg Anzeige UNAX auf 2 setzen
    MOVEABS(0,0) '8-Kurve
    MOVECIRC(0,0,0,10000,0)
    MOVECIRC(0,0,0,-10000,1)
    WAIT IDLE
  ENDIF 'Stoptaste
RETURN


do_stop:
  VR(3)=1 '7-Seg Anzeige UNAX auf 1 setzen
  IF (IN(0)=ON) THEN 'USER I/O UNAX Eingang 0, Stoptaste aktiv ?
    VR(10)=state_stop
  ELSE
    VR(10)=state_run
  ENDIF
RETURN
```

Import DXF- file (XY_TISCH_5.bas)

CAD2Motion is a program designed to allow users to translate CAD generated two dimensional motion paths in DXF format into Trio BASIC programs.

DXF-Import:
File / Import / DXF
the example file *form_2.dxf* is located on CD.



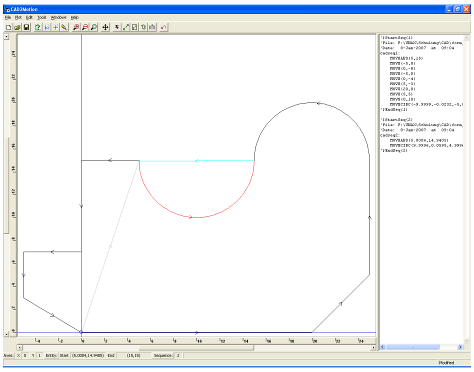
```
'$StartSeq(1)
'File: F:\UNAX\Schulung\CAD\form_
'Date:  8-Jan-2007  at  08:57
cadseq1:
    MOVEABS(5,15)
    MOVE(-5,0)
    MOVE(0,-8)
    MOVE(-5,0)
    MOVE(0,-4)
    MOVE(5,-3)
    MOVE(20,0)
    MOVE(5,5)
    MOVE(0,10)
    MOVECIRC(-9.9999,-0.0232,-5,(
'$EndSeq(1)

'$StartSeq(2)
'File: F:\UNAX\Schulung\CAD\form_
'Date:  8-Jan-2007  at  08:57
cadseq2:
    MOVEABS(5.0004,14.9405)
    MOVECIRC(9.9996,0.0595,4.999
'$EndSeq(2)
```

Adjustments, scaling

The following adjustments are examples that demonstrate the modification possibilities of an imported file.

The path is divided into sections with marked motion direction.
Often, the suggested sequence is not ideal and must be modified manually.

For example, the direction of a section must be changed. Select section and click on button .
The motion direction changes to the opposite.



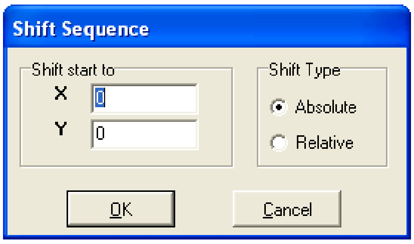
```
'$StartSeq(1)
'File: F:\UNAX\Schulung\CAD\form_
'Date:  8-Jan-2007  at  09:04
cadseq1:
    MOVEABS(5,15)
    MOVE(-5,0)
    MOVE(0,-8)
    MOVE(-5,0)
    MOVE(0,-4)
    MOVE(5,-3)
    MOVE(20,0)
    MOVE(5,5)
    MOVE(0,10)
    MOVECIRC(-9.9999,-0.0232,-5,(
'$EndSeq(1)

'$StartSeq(2)
'File: F:\UNAX\Schulung\CAD\form_
'Date:  8-Jan-2007  at  09:04
cadseq2:
    MOVEABS(5.0004,14.9405)
    MOVECIRC(9.9996,0.0595,4.999
'$EndSeq(2)
```

The tool has created two path sequences automatically. Now we want to reduce it to just one sequence.
So append MOVECIRC command of sequence 2 at the end of sequence 1. Then delete the complete sequence 2.

Redraw display in menu *Plot / Redraw* (F5)

```
'$StartSeq(1)
'File: F:\UNAX\Schulung\CAD\form_2.dxf
'Date:  8-Jan-2007  at  09:04
cadseq1:
    :
    MOVE(20,0)
    MOVE(5,5)
    MOVE(0,10)
    MOVECIRC(-9.9999,-0.0232,-5,0,0)
    MOVECIRC(-9.9996,-0.0595,-5,0,1)
'$EndSeq(1)
```

With the button shift sequence, the path origin can be shifted to zero position.
Select *cadseq1* into code editor, click the button and set X and Y coordinates to zero.



Shift Sequence

Shift start to
X 0
Y 0

Shift Type
● Absolute
○ Relative

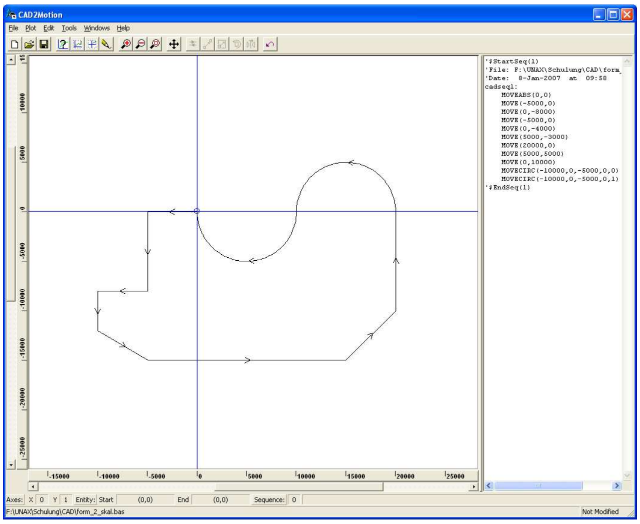
Into the DXF file, the connection points of the two semicircles are not precise. Therefore the MOVECIRC command values are rounded.

```
before:
MOVECIRC(-9.9999,-0.0232,-5,0,0)
MOVECIRC(-9.9996,-0.0595,-5,0,1)

new:
MOVECIRC(-10,0,-5,0,0)
MOVECIRC(-10,0,-5,0,1)
```

Finally, the motion path must be scaled to micrometer units.

Select *cadseq1* into code editor, click button and set scale factor to 1000.

save file *form_2_scal.bas*



```
'$StartSeq(1)
'File: F:\UNAX\Schulung\CAD\form_
'Date:  8-Jan-2007  at  09:58
cadseq1:
    MOVEABS(0,0)
    MOVE(-5000,0)
    MOVE(0,-8000)
    MOVE(-5000,0)
    MOVE(0,-4000)
    MOVE(5000,-3000)
    MOVE(20000,0)
    MOVE(5000,5000)
    MOVE(0,10000)
    MOVECIRC(-10000,0,-5000,0,0)
    MOVECIRC(-10000,0,-5000,0,1)
'$EndSeq(1)
```

Axes: X 0 Y 1 Entity: Start (0,0) End (0,0) Sequence: 0

F:\UNAX\Schulung\CAD\form_2_skal.bas Not Modified

Code integration into user application

There are two possibilities to integrate a generated code into the user application

The file *form_2_scal.bas* can be loaded directly into the project. Axis definitions and UNAX specific code must be added afterwards.

The second possibility is to copy and paste the generated motion code into the user application.

Because we already have a software framework, we decide to insert the code by copy and paste.

```
:
:
do_run:
  IF (IN(0)=ON) THEN 'USER I/O UNAX Eingang 0 (Stoptaste) gesetzt ?
    VR(10)=state_stop
  ELSE
    VR(3) = 2 '7-Seg Anzeige UNAX auf 2 setzen
    IF (IN(1)=ON) THEN 'USER I/O UNAX Eingang 1 (Kurvenform)
      MOVEABS(0,0) 'CAD-Kurve
      MOVE(-5000,0)
      MOVE(0,-8000)
      MOVE(-5000,0)
      MOVE(0,-4000)
      MOVE(5000,-3000)
      MOVE(20000,0)
      MOVE(5000,5000)
      MOVE(0,10000)
      MOVECIRC(-10000,0,-5000,0,0)
      MOVECIRC(-10000,0,-5000,0,1)
      WAIT IDLE
    ELSE
      MOVEABS(0,0) '8-Kurve
      MOVECIRC(0,0,0,10000,0)
      MOVECIRC(0,0,0,-10000,1)
      WAIT IDLE
    ENDIF 'Kurvenform
  ENDIF 'Stoptaste
RETURN
:
:
```

Complete application with error handling (XY_TISCH_6.bas)

```
'*******************************************************************************
' Programm:                     Beispielapplikation XY Tisch
' Autor:                        Jenny Science AG
'*******************************************************************************

CONSTANT "state_reset",1
CONSTANT "state_homing",2
CONSTANT "state_run",3
CONSTANT "state_stop",4
CONSTANT "state_error",5
```

Definition of an error state

```
RUN "UNAX_SYS"
WA(500) 'warten auf systemtask

MICROSTEP=OFF 'Mikrostep Modus

MERGE=ON 'Fahrbefehle werden aneindandergereiht ohne Verzoegerungsrampen

UNITS AXIS(0) = 16 'Achsparameter Achse 0 setzen
SPEED AXIS(0) = 20000
ACCEL AXIS(0) = 10000000
DECEL AXIS(0) = 10000000

UNITS AXIS(1) = 16 'Achsparameter Achse 1 setzen
SPEED AXIS(1) = 20000
ACCEL AXIS(1) = 10000000
DECEL AXIS(1) = 10000000


VR(0)= 0 'alle Ausgaenge von USER I/O UNAX loeschen
VR(1)= 0 'alle Inputs zu XENAX 1,2 loeschen
VR(2)= 0 'alle Inputs zu XENAX 3,4 loeschen
VR(3)= 0 '7-Seg Anzeige auf 0 setzen

VR(10) = state_reset ' Status der Applikation


WHILE 1=1 '----------------HAUPTLOOP--------------------------------------------

  ON VR(10) GOSUB do_reset, do_homing, do_run, do_stop, do_error

WEND '--------------------------------------------------------------------------


do_reset:
  VR(1)=34 'Input 2 setzen bei XENAX 1,2 -> Input Function EE ausloesen
  WA(100)
  VR(1)=0 'alle Inputs zu XENAX 1,2 deaktivieren
  WA(1000)

  VR(1)=VR(1) OR $11 'Input 1 setzen bei XENAX 1,2 -> Input Function PG1, Homing
  WA(100)
  VR(1)=VR(1) AND $EE 'Input 1 loeschen bei XENAX 1,2
  VR(3) = 1 '7-Seg Anzeige UNAX auf 1 setzen
  VR(10)=state_homing
RETURN


do_homing:
  IF (IN(8)=ON AND IN(11)=ON) THEN 'Output 1 lesen von XENAX 1,2 Homing fertig ?
    DEFPOS (0,0) 'Homing abgeschlossen, absolute Position in UNAX nullen
    WDOG=ON 'Endstufe UNAX freischalten fuer Puls-Richtungsansteuerung
    BASE(0,1) 'Definition der Achsgruppe fuer Fahrbefehle
    VR(10)=state_run
```

Check error state

```
  ELSE
    IF (IN(9)=ON OR IN(12)=ON) THEN 'Output 2 lesen von XENAX 1,2 Achsfehler ?
      VR(10)=state_error
    ENDIF
  ENDIF
RETURN


do_run:
  IF (IN(9)=ON OR IN(12)=ON) THEN 'Output 2 lesen von XENAX 1,2 Achsfehler ?
    VR(10)=state_error
  ELSE
    IF (IN(0)=ON) THEN 'USER I/O UNAX Eingang 0 (Stoptaste) gesetzt ?
      VR(10)=state_stop
    ELSE
      VR(3) = 2 '7-Seg Anzeige UNAX auf 2 setzen
      IF (IN(1)=ON) THEN 'USER I/O UNAX Eingang 1 (Kurvenform)
        MOVEABS(0,0) 'CAD-Kurve
        MOVE(-5000,0)
        MOVE(0,-8000)
        MOVE(-5000,0)
        MOVE(0,-4000)
        MOVE(5000,-3000)
        MOVE(20000,0)
        MOVE(5000,5000)
        MOVE(0,10000)
        MOVECIRC(-10000,0,-5000,0,0)
        MOVECIRC(-10000,0,-5000,0,1)
        WAIT IDLE
      ELSE
        MOVEABS(0,0) '8-Kurve
        MOVECIRC(0,0,0,10000,0)
        MOVECIRC(0,0,0,-10000,1)
        WAIT IDLE
      ENDIF 'Kurvenform
    ENDIF 'Stoptaste
  ENDIF 'Achsfehler
RETURN
```

```
do_stop:
  VR(3)=1 '7-Seg Anzeige UNAX auf 1 setzen
  IF (IN(9)=ON OR IN(12)=ON) THEN 'Output 2 lesen von XENAX 1,2 Achsfehler ?
    VR(10)=state_error
  ELSE
    IF (IN(0)=ON) THEN 'USER I/O UNAX Eingang 0, Stoptaste aktiv ?
      VR(10)=state_stop
    ELSE
      VR(10)=state_run
    ENDIF
  ENDIF
RETURN
```

If the user application is in error state, switch 2 starts the reset sequence and restarts the application

```
do_error:
  VR(3)=95 '7-Seg Anzeige UNAX auf "E" setzen
  IF (IN(2)=ON) THEN 'USER I/O UNAX Eingang 2, Resettaste gedrueckt ?
    VR(10)=state_reset
  ENDIF
RETURN
```

6.4 Test the user application

To test the application, set the switches as follows:

switch 0	stop	OFF
switch 1	curve	OFF
switch 2	reset	OFF

Start the application (see step 1, XY-TISCH_1.bas)

Both LINAX® axes execute the HORM sequence in addition to centering their slides.

Afterwards, the orthogonal axis executes a motion path like an “8” repetitively.

UNAX® writes “2“ into its 7-segment display, the XENAX® slave controllers “1“.

Set switch 1 (curve) to ON

If the path „8“ is finished, the motion path changes to DXF imported sequence.

Set switch 0 (stop) to ON

If the DXF motion path is finished, the axes stop operating. The UNAX writes “1” into its 7-segment display.

If an error occurs, the application state changes to ERROR, the UNAX shows „E“ on display.

A signal pulse on switch 2 starts the reset sequence and restarts the application again.

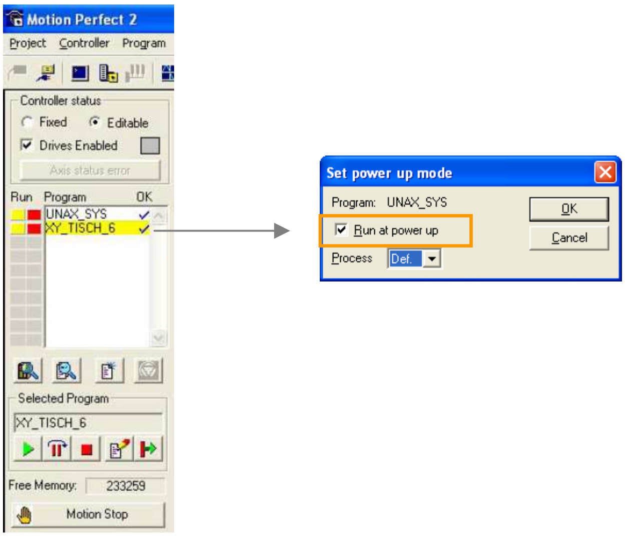
6.5 Completion, commissioning

A finished and tested program can be stored nonvolatile into the UNAX® flash memory.

With task option *Run at power up*, a task starts automatically after power up the UNAX® system.

Set cursor on XY_TISCH_6 resp. XY_TISCH in the program list, press the right mouse button and set the checkbox *Run at power up* in dialog.

After power up the UNAX® system, the application starts automatically.



Motion Perfect 2

Controller status: ○ Fixed ● Editable

☑ Drives Enabled

Run	Program	OK
🟨🟥	UNAX_SYS	✓
🟨🟥	XY_TISCH_6	✓

Selected Program: XY_TISCH_6

Free Memory: 233259

Set power up mode

Program: UNAX_SYS

☑ Run at power up

Process: Def.

7 Communication with UNAX® system

7.1 Standard

The UNAX® system is designed to operate in standalone mode. Synchronisation with host computers can be realised with different mechanisms.

Hardware handshake with digital I/O
The USER I/O UNAX interface supports eight digital outputs and up to 8 digital inputs to trigger and control actions on the UNAX® system.
Please take care about reservation of input channels in case of larger system configuration. See also chapter *5.6 User I/O UNAX / Read Inputs*

COM 1 (port 0)
Serial interface to internal Euro205x axis coordinator with TRIO commandset and system protocol.

COM 2 (port 1)
Serial interface, free programmable by an application. MODBUS RTU protocol optional

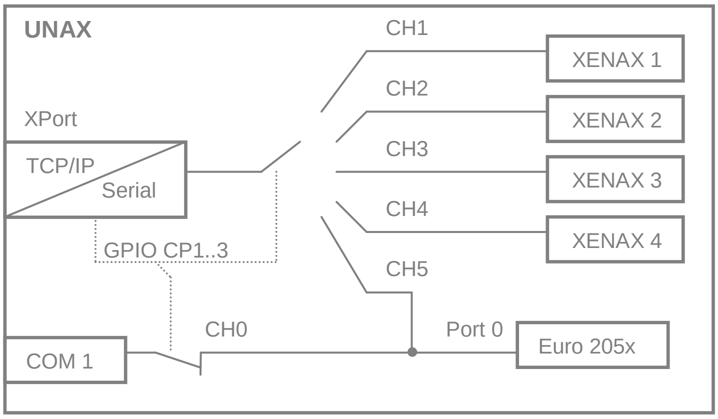
Please consider chapter *5.8* COM 1 / COM 2 Interface for detailed information.

7.2 Ethernet TCP/IP Gateway

In general, the TCP/IP interface is used for parameterisation and programming of the XENAX® slave servo controllers with the tool WebMotion®.

If the host system controls the complete UNAX® system over the TCP/IP interface, the host application has to support the channel selection mechanism to communicate with the different devices.

The internal TCP/IP Module XPort is able to select the communication channel to a target device with binary coded outputs CP1..CP3



-CP3[1]	-CP2	-CP1	CH0	CH1	CH2	CH3	CH4	CH5
0	0	0	1	0	0	0	0	0
0	0	1	1	1	0	0	0	0
0	1	0	1	0	1	0	0	0
0	1	1	1	0	0	1	0	0
1	0	0	1	0	0	0	1	0
1	0	1	0	0	0	0	0	1
1	1	0	1	0	0	0	0	0
1	1	1	1	0	0	0	0	0

[1] The caption –CP3..1 means, outputs CP3..1 must be defined as LOW-active

Channel CH0
The connection from UNAX COM 1 interface to the internal axis coordinator Euro205x is always active, except channel 5 is selected.

Channel CH1 .. CH4
Communication channel to a XENAX® slave servo controller. Active channel is marked with green LED placed by XENAX 1..4 connector.

Channel CH5
Communication channel to internal Euro205x axis coordinator. The connection from COM 1 to Euro205x will be interrupted.

Important
The serial interface parameters of all involved devices must be identical.
(XPort, XENAX® slave servo controller, Euro205x)

For detailed information about XPort CP1..CP3 activation see the document XPort_User_Guide.pdf (page 45).
The document is located on CD in the folder *UNAX Programmierung / Kanalselektion*.
A delphi example application UNAXswitch.exe with source code is also included.

8 Frequently asked questions (FAQ)

Are XENAX® slave servo controllers used for the UNAX® system compatible to standard versions of XENAX® servo controllers ? Are this devices exchangeable ?

Each standard XENAX® servo controller includes a XPort TCP/IP module. The XENAX® slave servo controller has just a RJ45 connector with proprietary pinout for UNAX® communication and control. Therefore, the devices are not compatible and can not be exchanged.

Can UNAX® be mounted displaced from the XENAX® slave servo controllers ?

We recommend strongly to mount the UNAX® system according chapter *9.3 Drilling plan of electrical cabinet.* The cabling is adapted and the electromagnetic compatibility is noncritical.

Is it possible to connect expansion boards from TRIO to the UNAX® device ?

The hardware connectors for expansion boards are not accessible.

Why does the servo parameters D_GAIN, I_GAIN and so on take no effect on drive behaviour of the axis ?

The XENAX® slave servo controllers operate as stepper axis from UNAX®'s point of view. The position loop is located inside of each XENAX® device.
The servo parameters D_GAIN etc. are designated for servo mode with position loop inside of the Euro205x device.

What is the resulting speed of a multi-axis motion command ?

In a UNAX® application, each axis can be defined with axis parameters like speed, acceleration and so on.

Linear motion with one axis
Speed and acceleration depends on the specific axis parameters.

Multi-axis linear motion, circular motion
The resulting speed and acceleration is taken from the first axis defined in the BASE command.

Example 1:
BASE (0,1)
MOVE (50000, 30000)
resulting speed is defined by axis 0

Example 2:
BASE (0,1)
MOVECIRC(0,0,0,10000,0)
resulting circular speed is defined by axis 0

How can a host system change variables to control an UNAX® application ?

Through the Euro205x protocol via serial interface COM 1 or the TCP/IP gateway channel 5.

Via serial interface COM 2 with INPUT command, or a customer defined protocol or MODBUS RT protocol.

Is it possible to teach positions ?

Go to a defined origin position with an Index

Clear internal position counter of UNAX® with DEFPOS(0)

Drive the axis with the FORWARD or MOVE command to a specific position, controlled by inputs for example

Read out internal position counter of UNAX®:
Teachpos = MPOS

Position values can be stored fixed into the flash memory of UNAX® with the command FLASHVR

The fourth axis does not work properly

A UNAX® standard system does not include four axes. In general, the fourth axis is defined as an external encoder input.
To use the fourth axis in stepper control mode, the axis type must be set explicit into the user application.

ATYPE AXIS(3) = 1

See also chapter *5.9* External Encoder

9 Technical data

9.1 Electronics, Firmware

Description	Data
Power supply	24VDC
Current consumption	300mA
Interfaces	Ethernet TCP/IP, integrated http Web Server 2 x RS 232, Development Environment, Application Pulse/Direction interpolator with f_{max} = 2MHz Master Encoder
Status display	7-Segment LED
Input digital	Up to 8 x 24V Pull-down, free programmable
Output digital	8 x 350mA, 24V open drain, free prgrammable

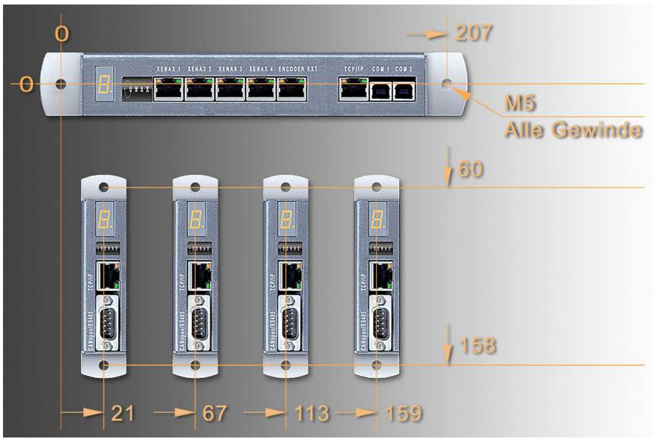
9.2 Dimensions UNAX® Ux4

Outside dimensions	190 x 140 x 35 mm

9.3 Drilling plan of electrical cabinet

Recommended system layout inside of electrical cabinet.

All screw thread M5



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